Claims

1) An apparatus for refueling an aircraft in-flight, the apparatus comprising:

a refueling receptacle on the aircraft, the receptacle being adapted for receiving a separate fuel probe when refueling the aircraft in-flight;

at least one sensor on the receptacle, the sensor being adapted for sensing forces acting on the receptacle by a fuel probe received by the receptacle when refueling the aircraft in-flight; and,

a control coupler on the aircraft, the control coupler communicating with the sensor and being adapted for controlling movement of the aircraft in-flight in response to forces acting on the receptacle that are sensed by the sensor.

2) The apparatus of Claim 1, further comprising:

the aircraft being an unmanned aircraft.

3) The apparatus of Claim 1, further comprising:

the sensor being one of a plurality of sensors on the receptacle, the plurality of sensors being adapted for sensing forces acting on the receptacle by a fuel probe received by the receptacle.

4) The apparatus of Claim 3, further comprising:

each sensor of the plurality of sensors being adapted for sensing a magnitude of an external force acting on the receptacle and a direction of the external force acting on the receptacle.

5) The apparatus of Claim 3, further comprising:

the plurality of sensors includes at least three sensors that are positioned on the receptacle to sense external forces acting on the receptacle along three mutually perpendicular axes.

6) The apparatus of Claim 5, further compromising:

each of the three sensors being adapted for sensing external forces acting on the receptacle in two directions along each of the three mutually perpendicular axes.

7) The apparatus of Claim 1, further comprising:

the aircraft having a center of gravity; and,

the control coupler being adapted for transforming forces acting on the receptacle into equivalent external forces and moments acting on the aircraft center of gravity.

8) The apparatus of Claim 1, further comprising:

the sensor being adapted for sensing a magnitude and direction of external forces acting on the receptacle; and,

the control coupler being adapted for controlling movement of the aircraft in a direction that eliminates the external force acting on the receptacle.

9) The apparatus of Claim 1, further comprising:

the aircraft having a control architecture that includes an outer-loop guidance component, an inner-loop guidance component, and a control surface mixer; and,

the control coupler communicating with the aircraft control architecture.

10) The apparatus of Claim 9, further comprising:

the control coupler communicating with the control surface mixer.

11) The apparatus of Claim 9, further comprising:

the control coupler being adapted for overriding the aircraft outer-loop guidance component.

12) The apparatus of Claim 1, further comprising:

the receptacle having a center axis that defines opposite positive and negative receptacle X-axis directions along the center axis, and defines opposite positive and negative receptacle Y-axis directions that are perpendicular to the receptacle X-axis directions, and defines opposite positive and negative receptacle Z-axis directions that are perpendicular to both the receptacle X-axis directions and the receptacle Y-axis directions;

and the sensor being one of a plurality of sensors that include an X-axis sensor that senses forces acting on the receptacle along the receptacle X-axis, a Y-axis sensor that senses forces acting on the receptacle along the receptacle Y-axis, and a Z-axis sensor that senses forces acting on the receptacle along the receptacle Z-axis.

13) The apparatus of Claim 12, further comprising:

the control coupler communicating with the X-axis sensor, the Y-axis sensor and the Z-axis sensor to receive signals from the sensors that are representative of forces acting on the receptacle.

14) The apparatus of Claim 13, further comprising:

the X-axis sensor, the Y-axis sensor, and the Z-axis sensor being adapted for producing signals that are representative of both a magnitude and a direction of forces acting on the receptacle.

15) A method of refueling an aircraft in-flight, the method comprising:

providing a refueling receptacle on the aircraft;

receiving a separate refueling probe by the receptacle when refueling the aircraft in-flight;

providing at least one sensor on the receptacle;

with the sensor, sensing forces acting on the receptacle from the refueling probe received by the receptacle;

providing a control coupler on the aircraft that receives signals from the sensor that are representative of the forces acting on the receptacle; and,

with the control coupler, controlling movements of the aircraft in-flight that cause the forces acting on the receptacle to be reduced.

16) The method of Claim 15, further comprising:

with the control coupler, controlling movements of the aircraft by changing acceleration of the aircraft.

17) The method of Claim 15, further comprising:

with the sensor, sensing both a magnitude and a direction of forces acting on the receptacle.

18) The method of Claim 15, further comprising:

the aircraft being an unmanned aircraft.

19) The method of Claim 15, further comprising:

providing a plurality of sensors on the receptacle that sense forces acting on the receptacle along three mutually perpendicular axes.

20) A method of refueling an unmanned aircraft in-flight, the method comprising:

providing a refueling receptacle on the aircraft, the refueling receptacle having a center axis that defines opposite positive and negative receptacle X-

axis directions along the receptacle center axis, and defines opposite positive and negative receptacle Y-axis directions that are perpendicular to the receptacle X-axis directions, and defines opposite positive and negative receptacle Z-axis directions that are perpendicular to both the receptacle X-axis directions and the receptacle Y-axis directions;

providing an X-axis sensor on the receptacle that senses forces acting on the receptacle along the receptacle X-axis;

providing a Y-axis sensor on the receptacle that senses forces acting on the receptacle along the receptacle Y-axis;

providing a Z-axis sensor on the receptacle that senses forces acting on the receptacle along the receptacle Z-axis;

providing a control coupler on the aircraft that communicates with the X-axis sensor, the Y-axis sensor, and the Z-axis sensor to receive signals from the sensors that are representative of forces acting on the receptacle, the control coupler being operative to control movement of the aircraft to reduce the signals that are representative of forces acting on the receptacle.